

(Virtual) Reality Check

Center Serves as Innovative Problem Solver

By Symone C. Skrzycki

Step into a theatre, slip on a pair of three-dimensional glasses and enjoy the show. You're not checking out a new movie at your favorite cinema – you're in a 62-seat immersive theater at Purdue University Calumet's Center for Innovation through Visualization and Simulation (CIVS) exploring solutions to a challenge facing your company.

"We have three missions that you can summarize in three key words: innovation, application and education," explains program director Chenn Zhou. "We train students on real-world problems and help (businesses) to improve their processes.

"Basically, we create a virtual environment."

Doreen Gonzalez-Gaboyan of the university's community outreach and development staff notes, "The environment could be a virtual city. It could be the inside of a hospital. It could be a protein structure. It could be a brain. They're (participants) either researching or studying and become a part of the environment."

The 6,300-square-foot multi-disciplinary research center houses simulation and visualization laboratories, a 3-D virtual classroom, conference rooms and more.

Since its inception in 2009, CIVS has helped industry partners save more than \$30 million in production and operating costs.

Given its Hammond location, many of the projects have involved virtual manufacturing. It has

assisted some of the region's largest employers, steelmakers ArcelorMittal and U. S. Steel Canada (a subsidiary of U.S. Steel) as well as energy utility NIPSCO (Northern Indiana Public Service Co.).

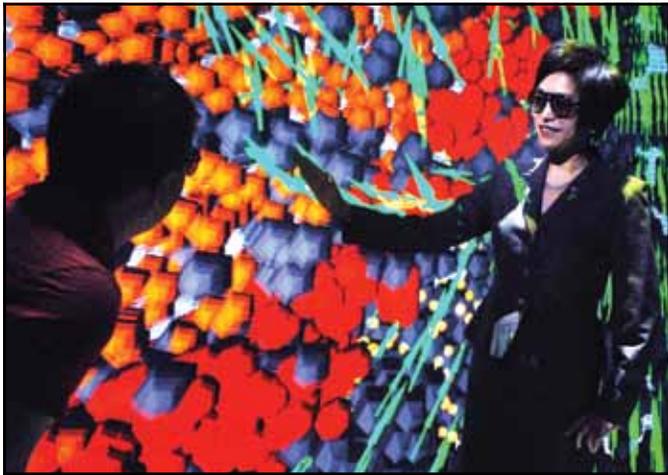
Zhou points out that the "areas of application are unlimited," noting that CIVS serves a wide range of fields that include health care, marketing, transportation, construction, economic development, education and non-profits – just to name a few.

What's so special about CIVS?

"Many people do visualization. Many people do simulation. But not many people combine them in the effective way we're doing it," she declares.

During a grand opening celebrating the center's expansion in October, Indiana Secretary of Commerce Dan Hasler praised CIVS (the following is an excerpt):

"CIVS is a jewel in the crown, which is so incredibly important," he asserted. "They are bait for me and this bait is easy to sell. Indiana will continue to draw companies through my ability to demonstrate on behalf of CIVS and Purdue. There's a source of talent, a source of innovation and cooperative spirit here. The students here are ready and waiting for new business and new companies for Northwest Indiana."



CIVS Program Director Chenn Zhou demonstrates the center's innovative technology.

Innovation at work

Purdue students tackle projects under the supervision of professors and staff.

"They're not just working in the lab," Zhou emphasizes. "They interact with collaborators. They go out in the field."

A partnership with U.S. Steel Canada (formerly Stelco) involved Pulverized Coal Injection (PCI) and blast furnace performance.

Simulations at CIVS revealed that "the oxygen we were injecting through the (PCI) lance was more detrimental than beneficial because it was being injected at a cold temperature," explains John D'Alessio, director of process and technology excellence. "It was actually cooling everything down and preventing efficient combustion."

Since this discovery, the company no longer injects cold oxygen through the lance. The result? Approximately \$8.5 million in annual savings and coke savings of 15 pounds per net tons hot metal.

ArcelorMittal's East Chicago laboratory – which services plants in the United States, Mexico, Brazil and Canada – has collaborated with CIVS on several projects that led to significant process improvements.

David White, director of the process research division at the East Chicago laboratory, describes one that was targeted toward operations in Brazil.

"It would have cost upwards of \$20 million and through the use of the sinter cooler simulation (at CIVS), we showed that a complete rebuild was not necessary and that only some relatively minor modifications to the equipment needed to be made to have productivity increase," he comments. "The expectation of this work we did for Brazil is that it will eventually be spread and applied to plants in other parts of the world."

NIPSCO's Bailly Generating Station in Chesterton partnered with CIVS to increase the efficiency of a coal-fired power unit.

"After we installed a pollution control device on Unit 7, we couldn't get full output out of Unit 8 (the larger of the two units)," recalls Tim Wright, now the principal engineer at NiSource's Michigan City Generating Station.

"Imagine a 'Y' upside down with Unit 8 on the left side and Unit 7 on the right, and combining at 'Y' (with the) flow going downstream from there."

Analysis of both boilers' flue gas ducts revealed flow imbalances and recirculation at the common duct.

"We went through successive iterations of turning vanes and were improving," Wright remarks. "So we decided to implement the best turning vane installation that Purdue had modeled."

NIPSCO now saves approximately \$1.9 million per year.

"We had to get a solution to re-establish that capacity, and this path provided that solution, which will be lasting," Wright emphasizes. "The turning vanes will be there forever and we will never have the recirculation set up in the duct. There is no risk to losing this benefit."

Win-win

Zhou and industry partners emphasize that CIVS benefits businesses and students.

"The ability now to visualize, in three dimension, what's going on has really ratcheted up our analysis ability," reflects ArcelorMittal's White.

"It's been a very good experience for my engineers, and I think for professor Zhou's students when we work together on these projects. They have an expertise that we don't necessarily have here, but we have the knowledge of the process, so by working together with these students they learn about our industry."

Wright adds, "I'm really impressed that Purdue is choosing to offer this to local industry. There is great value to industry and it also speeds up the development of students into productive members of the workforce. They're getting a real introduction to work life."

Zhou asserts that CIVS can attract new companies to the region and help existing companies thrive.

"Anything people can have to improve their competitive edge will also create additional jobs," she stresses.



U.S. Steel Canada's John D'Alessio describes the blast furnace research the company conducted with CIVS.



At an October 2011 ribbon-cutting ceremony, (from left) U.S. Rep. Pete Visclosky and Indiana Secretary of Commerce Dan Hasler learn from graduate assistant Basak Sanjit Kumar how applied research is preparing him for the workforce.

INFORMATION LINK

Resources: Chenn Zhou and Doreen Gonzalez-Gaboyan, Center for Innovation through Visualization and Simulation, at purduecal.edu/civs

David White, ArcelorMittal, at www.arcelormittal.com

Tim Wright, NIPSCO, at www.nipsco.com

John D'Alessio, U. S. Steel Canada, at www.ussteelcanada.com/ussca